from about 100 to about 10,000 $\mu C/cm^2$, and more preferably from about 1 to about 8,000 $\mu C/cm^2$. (Ross at column 6, lines 12-16.)

The Office Action admits that "Ross does not explicitly disclose that the electron beam treatment converts the film into: a film having dielectric constant of 3 or lower, or 2.8 or lower". Office Action at page 5, lines 13-15. However, the Office Action asserts that these limitations of independent Claim 1 are an inherent result of Ross' electron beam treatment.

Applicants respectfully traverse this assertion. The "dielectric constant of 3 or lower" limitation is not inherent in Ross's electron-beam irradiated siloxane films.

The specification at page 36, Table 4, indicates that siloxane compounds before electron beam irradiation have dielectric constants of less than 3. The specification at page 2, lines 15-23, indicates that JP-A-10-237307 and WO 97/00535 disclose irradiating and curing siloxane resin with electron beams to obtain insulating silica (SiO_2) films that usually have a dielectric constant of from 3.5 to 4.2. The dielectric constant of quartz (i.e., silica, SiO_2) can be 3.75-4.1. (Handbook of Chemistry and Physics, 52d edition, page E-48, copy enclosed.) Thus, electron beam irradiation of siloxane in the presence of oxygen can promote the formation of SiO_2 and an associated increase in dielectric constant.

Ross does not require, when film is cured with an electron beam, that oxygen in the atmosphere be minimized. Instead, Ross broadly discloses "the gaseous ambient in the electron beam system chamber may be nitrogen, hydrogen, argon, oxygen, or any combination of these gases". (Ross at column 6, lines 40-42, emphasis added.)

The Ross disclosure includes no examples of electron beam curing. Ross discloses

Although Ross contains various independent disclosures of ranges of certain process parameters, Ross is silent about any specific electron beam current, about any specific combination of electron beam curing process conditions, and about controlling the rate at which a film being electron beam irradiated will be cured. Ross leaves all this to the discretion of the skilled artisan:

> The period of electron beam exposure will be dependent on the strength of the beam dosage, the electron beam energy applied to the substrate and the beam current density. One of ordinary skill in the art can readily optimize the conditions of exposure. (Ross at column 5, line 67 to column 6, line 34.)

The longer it takes to cure an electron beam irradiated film, the higher the probability that oxygen, present either intentionally or as a contaminant, will react with the film, form SiO_2, and raise the dielectric constant of the cured film to greater than 3.

Because Ross is (1) silent about dielectric constant, (2) contains no disclosure of intentionally minimizing oxygen during electron beam curing, (3) discloses no examples of electron beam curing, and (4) says nothing specific about controlling the rate at which electron beam curing occurs, it is impossible to say that an electron-beam cured siloxane film dielectric constant of "3 or lower" is a *necessary* result of the Ross processes.

Thus, the independent Claim 1 limitation of "irradiating a film comprising at least one siloxane compound with electron beams at an irradiation dose of from 1 to 200 $\mu C/cm^2$ to thereby convert the film into a film having a dielectric constant of 3 or lower" is not inherent in Ross.

Because Ross is silent about "a dielectric constant of 3 or lower", and this limitation is not inherent in Ross, Ross neither anticipates nor renders obvious the claimed invention.

Claims 8 and 17 are further patentably distinguishable over Ross. As discussed above, Ross broadly discloses "the gaseous ambient in the electron beam system chamber may be nitrogen, hydrogen, argon, oxygen, or any combination of these gases". (Ross at column 6, lines 40-42, emphasis added.) However, Ross is silent about limiting oxygen, present intentionally or as background contamination, during electron beam irradiation. As discussed above, during electron beam irradiation oxygen promotes the formation of of SiO_2, with a dielectric constant of 3.5 to 4.2. Thus, Ross fails to suggest the features of Claims 8 and 17 of an electron beam irradiated film having "a dielectric constant of 3 or lower" produced by electron beam irradiation in an atmosphere having an oxygen concentration of "10,000 ppm or lower" (Claim 8) or "1,000 ppm or lower" (Claim 17).

Furthermore, any *prima facie* case of obviousness based on Ross is rebutted by the significant reduction in the dielectric constant of electron beam irradiated siloxane compounds that is achieved in accordance with the present invention using the recited "irradiation dose of from 1 to 200 $\mu C/cm^2$". See attached Declaration Under 37 C.F.R. § 1.132.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Enclosure:
Handbook of Chemistry and Physics, 52d edition, page E-48
Declaration Under 37 C.F.R. § 1.132

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PROPERTIES OF DIELECTRICS

In most cases properties have been determined by A.S.T.M. (American Society for Testing Materials) test methods at room temperature under standard conditions. Values will in general change considerably with temperature.

DIELECTRIC CONSTANTS OF SOME PLASTICS AND RUBBERS

Name	°C	Frequency (Hertz) 1×10^3	1×10^6	1×10^{10}
Plastics				
Phenol-formaldehyde	25–27	5.15–8.61	4.43–5.05	4.1–4.5
	7	6.35	4.90	4.5
	88	8.5	5.2	4.7
Phenol-aniline-formaldehyde	25	4.50	4.31	4.11
	79	4.75	4.51	4.35
Melamine-formaldehyde	24–28	6.0–6.90	5.82–6.20	5.5–5.55
	37	6.95	5.40	4.90
	88	11.8	6.0	5.5
Urea-formaldehyde	24	6.7	6.0	5.2
	80	7.8	6.8	
Polyamide resins:				
Nylon 66	25	3.75	3.33	3.16
Nylon 610	25	3.50	3.14	3.0
	84	11.2	4.4	3.4
Cellulose acetate	26	3.50–4.48	3.28–3.90	3.03–3.40
Cellulose nitrate	27	8.4	6.6	5.2
	78	7.5	6.2	5.2
Methyl cellulose	22	6.8	5.7	4.3
Ethyl cellulose	25	3.09	3.01	2.90
Silicone resins	25	3.79–3.91	3.79–3.82	3.82
Polyethylene	12	2.37	2.35	2.33
	23	2.26	2.26	2.26
Polyisobutylene	25	2.23	2.23	2.23
Vinylite QYNA	20	3.10	2.88	2.85
	76	3.83	3.0	2.8
	110	8.6	–	
Vinylite 5544	25	7.20	4.13	3.05
Vinylite 5901	25	5.5	3.4	3.0
Vinylite VU	24	5.65	3.30	2.80
	79	8.15	5.5	3.4
Vinylite VYHW	20	3.12	2.91	2.83
Vinylite VYNW	20	3.15	2.90	2.8
Polyvinyl chloride	25	4.55 (1×10^4)	3.3	
Polyvinylidene and vinyl chloride	23	4.65	3.18	2.82
	84	4.94	4.40	3.2
Polychlorotrifluoroethylene	25	2.76	2.48	2.36
Polytetrafluoroethylene (Teflon)	22	2.1	2.1	2.1
	100	2.04	2.04	
Polyvinylalcohol acetate	25	7.8	5.2	
	85	100.	10	
Polyvinylacetals	26–27	3.02–3.12	2.86–2.92	2.67
	88	3.5	3.1	2.85
Polyacrylates:				
Lucite	−12	2.9	2.63	2.50
	23	2.84	2.63	2.58
	81	3.45	2.72	2.59
Plexiglas	27	3.12	2.76	
Polystyrene	25	2.54–2.56	2.54–2.56	2.55
	80	2.54	2.54	2.54
Styrene copolymers	25	2.55–2.95	2.55–2.80	2.55–2.77
Polyesters	25	3.22–4.3	3.12–4.0	2.94–2.98
Alkyd resins				
Alkyd isocyanate foam	25	1.223	1.218	1.20
Plaskon, clay filled	25	5.26	4.92	4.77
Plaskon, glass filled	25	5.04	4.73	4.50
Epoxy resins	25	3.63–3.67	3.52–3.62	3.32–3.35
Rubbers				
Hevea, vulcanized	27	2.94	2.74	2.42
Hevea compound	27	36.	9	6.8
Gutta percha	25	2.60	2.53	2.47
Balata	25	2.50	2.50	2.42
Buna S	20	2.66	2.56	2.52
Butyl rubber compound	25	2.42	2.40	2.39
Neoprene	24	6.60	6.26	4.5
Silicon rubber	25	3.12–3.30	3.10–3.20	3.06–3.18

DIELECTRIC CONSTANTS OF CERAMICS

Material	Dielectric Constant 10^6 Cycles	Dielectric Strength Volts/mil	Volume Resistivity Ohms-cm 23°C	Loss Factor*
Alumina	4.5–8.4	40–160	10^{11}–10^{14}	0.0002–0.01
Corderite	4.5–5.4	40–250	10^{12}–10^{14}	0.004–0.012
Forsterite	6.2	240	10^{14}	0.0004
Porcelain (Dry Process)	6.0–8.0	40–240	10^{12}–10^{14}	0.003–0.02
Porcelain (Wet Process)	6.0–7.0	90–400	10^{12}–10^{14}	0.006–0.01
Porcelain, Zircon	7.1–10.5	250–400	10^{13}–10^{15}	0.0002–0.008
Steatite	5.5–7.5	200–400	10^{13}–10^{15}	0.0002–0.004
Titanates (Ba, Sr, Ca, Mg, and Pb)	15–12,000	50–300	[illegible]	0.0001–0.02
Titanium Dioxide	14–110	100–210	[illegible]	0.0002–0.005

DIELECTRIC CONSTANTS OF WAXES

Acrawax C	2.4		0.005
Beeswax, white	2.75–3.0	5×10^{14}	0.025
Beeswax, yellow	2.9	8×10^{14}	0.029
Candelilla	2.25–2.50		
Carnauba	2.75–3.0		
Cerese, brown C	2.27		0.0025
Ceresine	2.25–2.50	[illegible]	0.0011
Halowax 1001	[illegible]	[illegible]	0.014
Halowax 1013	[illegible]		0.036
Halowax 1014	[illegible]		0.035
[illegible]			[illegible]

DIELECTRIC CONSTANTS OF GLASSES

Type	Dielectric Constant at 100 mc 20°C	Volume Resistivity 350°C megohm-cm	Loss Factor*
Corning 0010	6.32	10	0.015
Corning 0080	6.75	0.13	0.058
Corning 0120	6.65	100	0.012
Pyrex 1710	6.00	2,500	0.025
Pyrex 3320	4.71	.....	0.019
Pyrex 7040	4.65	80	0.013
Pyrex 7050	4.77	16	0.017
Pyrex 7052	5.07	25	0.019
Pyrex 7060	4.70	13	0.018
Pyrex 7070	4.00	1,300	0.0048
Vycor 7230	3.83		0.0061
Pyrex 7720	4.50	16	0.014
Pyrex 7740	5.00	4	0.040
Pyrex 7750	4.28	50	0.011
Pyrex 7760	4.50	50	0.0081
Vycor 7900	3.9	130	0.0023
Vycor 7910	3.8	1,600	0.00091
Vycor 7911	3.8	4,000	0.00072
Corning 8870	9.5	5,000	0.0085
G. E. Clear (Silica Glass)	3.81	4,000–30,000	0.00038
Quartz (Fused)	3.75–4.1 (1 mc)		0.0002 (1 mc)

* Power factor × dielectric constant equals loss factor

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